Coverage of seasonal malaria chemoprevention in Burkina Faso 2017

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Summary

Seasonal malaria chemoprevention (SMC) was introduced in Burkina Faso in 2014 in seven districts: Kaya, Bogandé, Garango and Sebba (through the World Bank), Tougan and Seguénéga (through the non-governmental organisation (NGO) Terre des Hommes) and Boussé (through ALIMA). In 2015 and 2016 SMC was scaled up through the ACCESS-SMC project to 11 and 31 districts for the respective years, and with funding from the World Bank, a total of 54 of the 70 districts in the country benefitted from SMC by 2016. In 2017, SMC was implemented in 59 districts, of which 39 were supported by Malaria Consortium through funding by Unitaid (ACCESS-SMC) and Good Ventures. Between July and October, an estimated 2.86 million children were targeted with SMC, about 50 percent of whom lived in districts supported by Malaria Consortium, where a total of about 5.7 million treatments were administered.

SMC coverage in Malaria Consortium areas in Burkina Faso has been consistently very high, demonstrating the high levels of coverage that can be achieved through door-to-door delivery. A total of 86 percent of eligible children received four monthly treatments in 2015 and in 2016, resulting in a substantial reduction in malaria cases and deaths. It is important to verify the validity of these estimates of coverage, and to understand how the high level of coverage has been achieved, so that it can be replicated elsewhere, and to ensure it is maintained in Burkina Faso. Therefore, in 2017 cluster sample surveys were undertaken after each of the four cycles to determine coverage. In the final survey, questions were included about caregiver knowledge of SMC, the process of SMC administration and bed net use by all members of the household. SMC coverage in cycles 1 to 3 was also assessed retrospectively in the final survey, to confirm the validity of coverage assessment through a single survey at the end of the transmission season.

The surveys were conducted in the regions of Nord, Est, Centre Est, Centre Nord, Centre Ouest, Centre Sud and Plateau Central. Fifty-five settlements were selected with probability proportional to size, and compact segment sampling was used to select households which were visited in August, September, October and November shortly after each SMC cycle. All children aged three months to seven years who slept in the household the night before the survey were included, and SMC status was determined from the SMC record card and by asking caregivers to recall treatments the child received. In the final survey, questions were included about caregivers' knowledge of SMC, the process of SMC administration, adverse drug reactions and the use of LLINs by all members of the household. Primary outcomes were the mean coverage per cycle, and the proportion of children who received four monthly treatments.

A total of 1,134 children were surveyed after cycle 1, 1,971 after cycle 2, 2,110 after cycle 3 and 2,108 after cycle 4. Each month about 95 percent of eligible children received SMC (94.6 percent in July, 95.8 percent in August, 94.8 percent in September and 95.9 percent in October). From the final survey, a total of 90.5 percent of children received four monthly treatments and only 0.3 percent did not receive SMC at all. The mean coverage per cycle over the four cycles was 95.6 percent (95% confidence interval, 93.8%, 97.4%), estimated from the post-cycle surveys. This compares with 96.3% (94.7%,97.8%) estimated from the final survey. This close agreement indicates, as has been found in Nigeria and Chad, that a survey at the end of the last cycle can be used to estimate mean coverage over the four cycles.

Coverage was equitable, with, in each cycle, similar levels of coverage in each socio-economic group. Coverage was similar in boys and girls. Among children aged 6-7 years, nine percent in the final survey had been treated, but this varied by region. It may be useful in future surveys to ask about receipt of SMC in a wider age range to verify that treatment is not being given to older groups.

The high level of card retention in Burkina Faso (87.9 percent of eligible children had a card for inspection in the final survey) makes survey estimates of coverage less reliant on caregiver recall than in other countries, although there was evidence that dates are not always documented on cards, so it remains important to ask caregivers about treatment even when a card is available.

The dose of sulfadoxine-pyrimethamine (SP) and the first dose of amodiaquine (AQ) were administered by the health worker for 98.5 percent children. Almost all caregivers said they administered the second and third doses of AQ. The reasons given by the small number of caregivers who did not give the doses of AQ on day two or three were that they (the caregiver) were away, were too busy, forgot or did not understand the need to give the second and third dose.

Each month over 90 percent of households were aware of the date of the SMC in advance of the campaign. Criers were widely used. Where fewer households reported being aware of campaign dates, coverage tended to be lower. Reasons caregivers gave for missed treatments included that they were away on the day of SMC, and that they encountered problems such as drug stock-outs at distribution points.

Caregivers were asked 10 questions about their understanding of SMC. The questions covered: the purpose of SMC and whether it can prevent malaria or malaria and other diseases, the number of tablets to be taken each day, the number of months a child should receive SMC, the importance of adherence to and completing the treatment course, the need to seek care if the child becomes unwell, and not to use the tablets to treat another person or someone who is unwell. Most of the questions were answered correctly. Question three (regarding whether SMC can prevent other diseases) was answered less well, with only 69 percent of caregivers giving the correct answer.

When caregivers were asked about the steps followed by the health worker when they visited for SMC at cycle 4, over 90 percent of caregivers said the health worker checked the child's age and explained about administering the tablets, checked for fever, and asked if the child had taken other medications in the last month or had allergies to any medicines. The mean overall score of 7.6, on an eight-point scale measuring community health workers' (CHW) adherence to guidelines, was higher than in other countries where the same questionnaire has been used. The household member present during SMC administration was the mother in 96 percent of cases. When asked about the time spent waiting for the health worker to come, and the time taken to administer SMC in the household, most reported they waited less than one hour, and said the CHW spent less than 15 minutes at the household, with few reporting that SMC administration for the household took more than 30 minutes.

A total of 94 children (5.3 percent) were reported to have been unwell since they received SMC at cycle 4. The symptoms were fever (83 children), vomiting (24 children), diarrhoea (23 children), yellow eyes (4 children), abdominal pain (11), loss of appetite (16) and drowsiness (9). No serious adverse events were reported.

Use of bed nets was high. A total of 95.3 percent of children eligible for SMC slept under a bed net the night before the survey, and 91 percent of all household members did. Coverage was similar in all age groups except adolescents, which had lower coverage. Coverage varied by region, being lower in Nord and Centre Sud. Coverage was similar in all socioeconomic groups and there was no difference in coverage by gender. Access to a net (the percentage of the population that could sleep under a net if one net was shared between two people) was 95.6 percent. 96.5 percent of households had at least one bed net.

In 2017, surveys conducted after each SMC cycle confirmed that very high levels of SMC coverage are being achieved in regions where SMC is being implemented through Malaria Consortium in partnership with the National Malaria Control Programme through door-to-door delivery. Coverage of 95 percent in each cycle and 90 percent of children receiving four treatments is therefore a realistic target to set for all SMC programmes. It was outside the scope of this survey to document the process of community sensitisation, drug distribution and supervisions; however, it is important that these methods are documented to assist other programmes to improve levels of coverage.

SMC implementation timing appeared to be appropriate. SMC cycles took place four weeks apart starting in July (28th-31st), the second cycle in August (24th-27th), the third in September (20th-23rd) and the fourth in October (17th-20th). The timing of the first cycle was on schedule and the interval between cycles was close to exactly four weeks. Inspecting the timing in relation to the pattern of seasonality of malaria in each region, four cycles starting at the end of July appears optimal in the regions of Nord and Centre Nord, but further south five cycles starting at the beginning of July could be justified, and in the southern regions (Cascades and Sud Ouest, outside the current Malaria Consortium area), SMC for six months may be necessary. Older children may also benefit from inclusion in SMC programmes. As SMC delivery has consistently achieved very high coverage in Burkina Faso, steps should now be taken to adapt the strategy to local transmission patterns, carefully targeting the number and timing of cycles and the age groups included, to optimise the impact of SMC in preventing malaria deaths. This will involve assessing the incremental cost-effectiveness of any extensions to SMC to ensure targeting of the intervention is done in the most cost-effective manner.

Background

There were an estimated 7.9 million cases of malaria and 21,300 deaths due to *Plasmodium falciparum* malaria in Burkina Faso in 2016 (WHO 2017), in a population of 18.7 million (2016). The main vectors are *An gambiae*, *An arabiensis* and *An funestus*. The main preventive control methods are LLINs, intermittent preventative treatment in pregnancy (IPTp), and SMC. Coverage of long lasting insecticide treated nets (LLINs) was over 80 percent in 2016 (the percentage of all age groups who slept under an LLIN the night before the survey). There has been a gradual increase in the use of diagnostic tests to confirm malaria at health facilities over the last five years; in 2016 over 80 percent of suspected cases were tested. From June 2016, artemisinin-based combination therapy (ACT) (with artemether-lumefantrine (AL)) was provided free for children under five years of age and pregnant women. All districts in Burkina Faso are eligible for SMC; the southern districts have a longer season and could potentially benefit from SMC being provided for five months, but they were still meeting the criteria (60 percent of cases in four consecutive months) when a specific definition (fever with high density parasitaemia confirmed by microscopy) was used (Tiono *et al.* 2014). SMC was introduced in 2014 in seven districts: Kaya, Bogandé, Garango and Sebba (through the World Bank), Tougan and Seguénéga (through the NGO Terre des hommes) and Boussé (through ALIMA). In 2015 and 2016, SMC was scaled up through the ACCESS-SMC project (11 districts in 2015, 31 districts in 2016), and with funding from the World Bank, a total of 54 of the 70 districts in the country benefitted from SMC programmes by 2016. In 2017, 59 districts were included in SMC distribution over four months between July and October, targeting an estimated 2.86 million children; 39 out of 59 districts were supported by Malaria Consortium through funding from Unitaid (ACCESS-SMC) and Good Ventures serving roughly 50 percent of the children targeted in the country.

SMC coverage in Malaria Consortium areas in Burkina Faso has been consistently very high, demonstrating the high levels of coverage that can be achieved through door-to-door delivery. A total of 86 percent of eligible children received four monthly treatments in 2015 and in 2016, resulting in a substantial reduction in malaria cases and deaths. It is important to understand how this high level of coverage has been achieved, to be able to replicate the same level of coverage in other countries, and to ensure it is maintained in Burkina Faso. In 2017, cluster sample surveys were therefore undertaken after each of the four cycles to determine coverage. In the final survey, questions were included about caregiver knowledge about SMC, the process of SMC administration, and LLIN use by all members of the household. SMC coverage in cycles 1 to 3 was also assessed retrospectively in the final survey, to confirm the validity of coverage assessment through a single survey at the end of the transmission season.

Methods

Fifty-five settlements (clusters) were chosen, with probability proportional to estimate population, from a list of all settlements in the districts where SMC was implemented by Malaria Consortium. Compact segment sampling was used to select households, whereby a sketch map of each settlement was prepared. This was divided into segments of approximately constant population, with one segment selected by simple random sampling. The same clusters were used in each of the four surveys. In each survey, all dwellings in the selected segment were included in the survey.

Sample size

The sample size of at least 1,000 children in 55 clusters was chosen in order to have a margin of error of about +/- six percent for an overall estimate of coverage, if coverage is about 80 percent and assuming a rate of homogeneity of 0.3 based on previous surveys, while having adequate precision in important subgroups (e.g. about +/-10 percent in each of three equal geographical strata if coverage is 80 percent and somewhat better precision for groupings that are primarily within clusters, for example for five wealth rankings if these were within-cluster groupings there would be an expected margin of error on a coverage of 80 percent of about +/-8 percent). Compact segment sampling is preferred over listing dwellings or households and selecting a random sample, as the preparation of the lists is known to be prone to selection bias. For assessing service delivery where accessibility of the household may be a major factor in receipt of intervention, it is important to minimise selection bias based on accessibility. Compact segments remove subjectivity in household selection and survey completeness is easier to verify, at the expense of increased homogeneity of the sample and less predictable sample size (Kish 1965; Turner 2003; Milligan et al. 2004).

Probability proportional to size sampling

Fifty-five clusters were chosen: 50 were the same clusters selected for the 2016 survey using probability proportional to size (PPS) from a list of all settlements in the areas covered by ACCESS-SMC in 2016, and a further five clusters were selected with PPS from the following SMC districts which were added in 2017: Mangodara, Kongoussi, Dafra, Léna, Gourcy, Seguénéga, Yako, Boussé. Sampling locations are shown in Figure 1. (This approach was adopted to avoid the need for mapping a new selection of clusters, due to time constraints, but resulted in a lower sampling fraction in the districts added in 2017 than in other areas.)

Staff training, organisation and data collection

Surveys were conducted by four teams, each covering 13 or 14 clusters, each team including three or four data collectors and a supervisor, coordinated by two senior scientists, two coordinators, a mapper and a data manager. An initial training session was held over one day to install the questionnaire software on the devices, and covered editing and saving completed data records. A second training session covered the conduct of interviews and completing the questionnaire. Heads of household and caregivers were asked for consent after the aims of the survey and the nature of the interview were explained to them. Their signed consent was recorded on paper consent forms. In the first three surveys, a short questionnaire was used to ask about SMC treatment, awareness of campaign dates, SMC administration and adherence. In the final survey, a longer questionnaire was used which included socio-demographic details about the caregivers, questions about caregiver knowledge of SMC, the process of SMC administration, and bed net use by all members of the household. Data was captured on tablet PCs. When the segmentation was completed, the number of

segments was entered, and the PC selected a segment at random. The global positioning system (GPS) location of each household was automatically recorded. In the final survey, both sides of the SMC cards were photographed, and the images uploaded to permit verification of the data from the card that was manually entered. For the first survey, the iForm platform was used to capture data, while for the surveys after cycles 2, 3 and 4, the Dharma platform was used. Data was uploaded to a server at the London School of Hygiene & Tropical Medicine (LSHTM) as soon as the tablet could access an internet connection. All children aged three months to seven years who slept in the household the night before were included in the survey. In addition, bed net use was recorded for all members of the household who slept there the night before, after making a complete roster of household members and inspecting each sleeping place. SMC status was determined from the caregiver's report and from the SMC card, if available. A child was considered to have been treated if the caregiver reported the child was treated, or if the card indicated treatment by a tick and/or a date. It is known that CHWs sometimes do not record dates on the card, so when a caregiver declared the child had been treated, but there was no indication in the card, we assumed the child had been treated. When the card showed a treatment, but the caregiver reported no treatment, it was assumed the child had been treated (on the basis that CHWs are unlikely to record a treatment if the child was not treated). Field workers entered the name, village, card number, treatments and treatment dates from the card, and in the final survey cards were photographed to enable verification of the data entered. At the surveys conducted after cycles 1, 2 and 3, only treatment in the immediately preceding cycle was recorded. In the final survey after cycle 4, treatments in each of the previous cycles were recorded. Call-back visits were arranged to minimise non-response. Supervisors repeated interviews for a subset of children, in order to check performance of interviewers (see Annex).

Statistical methods

In the analysis, each observation was weighted by the inverse of the sampling probability. Larger settlements were divided into sectors, one of which was selected by simple random sampling. The settlement or sector was then divided into segments of approximately equal population, and one was chosen at random. All dwellings in the selected segment were then included in the survey sample. The sampling probability was therefore defined as $50 \times (N_i/NT_{50}) \times (1/Sec_i) \times (1/S_i) \times (Hr_i/H_i)$ for individuals in clusters i=1,50, where N_i is the estimated population size of settlement i, NT_{50} the total population of the area from which the 50 clusters were drawn, Sec_i the number of sectors, and S_i the number of segments. H_i is the number of households and Hr_i the number of households that responded. The sampling weight therefore includes the design weight and a non-response weight. The corresponding sampling probability in the five extra clusters is $5 \times (N_i/NT_5) \times (1/Sec_i) \times (1/S_i) \times (Hr_i/H_i)$ for clusters i=51,55.

In the analysis, children were considered definitely eligible to have received SMC at the cycle immediately before the survey, if they were aged at least three months and less than five years at the survey. Children were considered eligible to receive four treatments if they were aged at least three months at cycle 1 and were less than five years old at the time of the survey. Children aged six years and over at the time of the survey were considered outside the age range for SMC. Children aged between five and six years at the time of the survey were excluded on the basis that their precise age in months could often not be determined accurately and they may or may not have been eligible for SMC. Agreement between caregiver recall and treatment recorded on the SMC card was

assessed using the kappa statistic. Estimated coverage at cycles 1-3 obtained in the surveys immediately after the cycles was compared with the estimates obtained in the final survey, in order to establish whether final survey estimates could be relied upon. The mean coverage over the four cycles, which is the primary indicator of coverage, was also compared. These comparisons were limited to children eligible to receive four treatments, and to the clusters which were surveyed in all four surveys. A 95 percent confidence interval for the difference in coverage between the surveys was calculated using the standard error of the difference between the two ratio estimates. Confidence intervals for proportions were obtained using linearised variance for ratio estimators and applying a logit transformation to ensure the interval remained within the range (0,1). The proportion of eligible children who received four treatments was also estimated from the final survey. Equitability of delivery was assessed by comparing coverage across wealth rankings determined from household assets using principal components analysis. Use of LLINs was assessed as the percentage of household members who slept under a net the night before the survey. Access to a LLIN was defined as the percentage of household members who could sleep under a net if one net was shared between two people, and net ownership was defined as the percentage of households with at least one LLIN and the percentage of households with one LLIN per two people. Standard errors and 95 percent confidence intervals were calculated for each indicator (Annex). Design effects due to clustering (Annex Table A2) were estimated for each indicator, as $\text{Deff}_{clustering}= \text{Deff}_{overall}/ \text{Deff}_{weighting}$, to exclude effects of weighting. $\text{Deff}_{overall}$ is the overall design effect and $\text{Deff}_{weighting}$ the design effect due to weighting. The rate of homogeneity, roh, was calculated as $(\text{Deff}_{clustering}-1)/(b-1)$, where b is the weighted mean cluster size, $b=\Sigma n_i^2/\Sigma n_i$ (where n_i is the number of respondents in cluster i).

Figure 1: Sampling locations
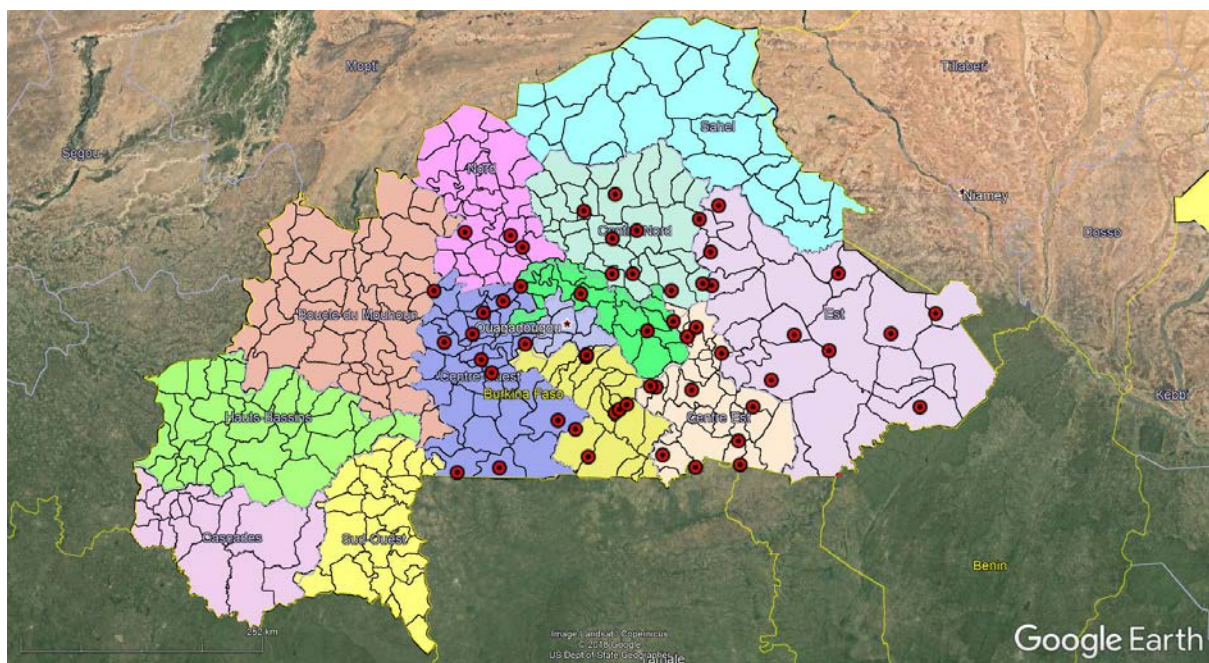
Data management

For the first survey, the iForm platform was used to capture data; for the surveys after cycles 2, 3 and 4, the Dharma platform, which was adopted by Malaria Consortium for data capture, was used.

Individual forms were created using the web portal provided by Dharma Platform. A limitation of Dharma is that it doesn't allow complex data structures (hierarchies of more than one level). The Bed Net Survey and the Household Roster therefore had to be separated from the main survey, and the linking household IDs had to be entered manually, which could lead to inconsistencies that had to be resolved later. When the same questionnaires were implemented in iForm, the platform automatically generated unique IDs linked to these data. Survey teams in Burkina Faso, Chad and Nigeria used the same data capture tools. The data was uploaded centrally to a Dharma platform server in the US. From there we were able to obtain complete downloads of the data as it was collected. Routinely the data manager at LSHTM provided each country team with a complete dataset for their country, and PDF documents showing the locations of new clusters as data were added. These data sets were stored on the LSHTM FILR (MyFiles) system, with separate folders for each country and access restricted to country team members and LSHTM/Malaria Consortium staff involved in the project. At the end of the data collection process a version was created in MS Access that provided a relational database view of the data, using referential integrity to ensure correct linkage. This included joining the Bed Net and Household Roster data to the main survey. These databases were the main source used for analysis. Dharma did not originally allow for image capture: this feature was introduced in time for the cycle 4 survey. Images were stored by default at full resolution without compression. Very fast internet connections were needed to upload images, and when large images could not be uploaded, Dharma stopped uploading all other data. This resulted in several months of delay in accessing survey data, as it was necessary for Dharma to update the app so that it uploaded data first, and then uploaded a compressed version of the image file. Data was eventually uploaded by the end of May 2018. A further difficulty encountered by survey teams was that there was no clear indication as to when uploading of survey data from the tablet PC device was complete: the uploads had to be checked manually from London and survey teams asked to repeat uploads from each device until they had completed. In addition, a number of app and web portal features did not work correctly, leading to delays until the bugs had been fixed by Dharma. Following these difficulties, an implementation of the survey tools has now been developed in ODK, which LSHTM will use for any future coverage surveys. Malaria Consortium also dropped Dharma in light of the issues experienced above, moving to Magpi for its 2018 surveys.

Seasonal malaria chemoprevention delivery in 2017

SMC cycles took place four weeks apart starting in July (28th-31st), the second cycle in August (24th-27th), the third in September (20th-23rd) and the fourth in October (17th-20th). The timing of the first cycle was on schedule and the interval between cycles was close to exactly four weeks. A total of about 5.7 million treatments were administered to a target population of about 1.5 million children (Table 1).

Table 1: Reported number of doses administered in 2017, from tally sheets

Region	Target population 3-59 months	Number of treatments administered			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
Nord	157,437	158,881	164,430	165,971	167,778
Centre Nord	295,054	301,579	303,035	309,656	315,950
Plateau Central	163,028	168,810	168,816	171,598	174,913
Est	320,508	335,419	339,307	351,945	358,278
Centre Ouest	290,920	295,002	301,873	310,640	318,635
Centre Sud	145,309	141,215	140,954	148,664	152,415
Centre Est	276,740	280,593	277,439	242,325	252,396
Hauts Bassins	47,532	50,019	46,842	47,665	53,361
Cascades	41,286	46,331	48,253	48,561	48,577
Total	1,737,814	1,777,849	1,790,949	1,797,025	1,842,303

Inspecting the timing in relation to the pattern of seasonality (Figure 2), four cycles starting at the end of July appears optimal in the regions of Nord and Centre Nord; but further south, five cycles starting at the beginning of July could be justified, and in the southern regions (Cascades and Sud Ouest), SMC for six months may be necessary. Figure 2 shows the pattern of seasonality based on all confirmed cases under 5 years in ENDOS from 2013 to 2016. Table 2 shows the percentage of cases falling in 4-month and 5-month windows in 2014 (pre-SMC) and 2015. Modelling suggests that adding a fifth month (and a sixth month in the far south) may be cost-effective. As SMC delivery has consistently achieved very high coverage in Burkina Faso, steps should now be taken to adapt the strategy to local transmission patterns to optimise its impact in preventing malaria deaths.

Table 2: The percentage of annual cases of confirmed malaria in national ENDOS database, <5yrs of age, falling in 4 or 5 consecutive months

Region	2015			2014		
	Jul-Oct	Aug-Nov	Jul-Nov	Jul-Oct	Aug-Nov	Jul-Nov
Boucle du Mouhoun	54%	64%	68%	61%	68%	75%
Cascades	51%	46%	62%	51%	47%	65%
Centre	54%	62%	67%	59%	65%	73%
Centre Est	58%	69%	72%	64%	68%	77%
Centre Nord	58%	67%	69%	57%	66%	68%
Centre Ouest	55%	62%	68%	59%	63%	71%
Centre Sud	66%	57%	66%	67%	65%	77%
Est				60%	65%	73%
Hauts-Bassins	57%	46%	60%	56%	55%	69%
Nord	56%	66%	69%	60%	71%	74%
Plateau central				69%	76%	81%
Sahel	61%	66%	68%	56%	68%	70%
Sud Ouest	56%	52%	67%	50%	49%	64%

Figure 2: Seasonal pattern of confirmed malaria in under 5s (all cases in ENDOS 2013-2016), showing timing of the first and fourth 2017 cycles in Malaria Consortium regions
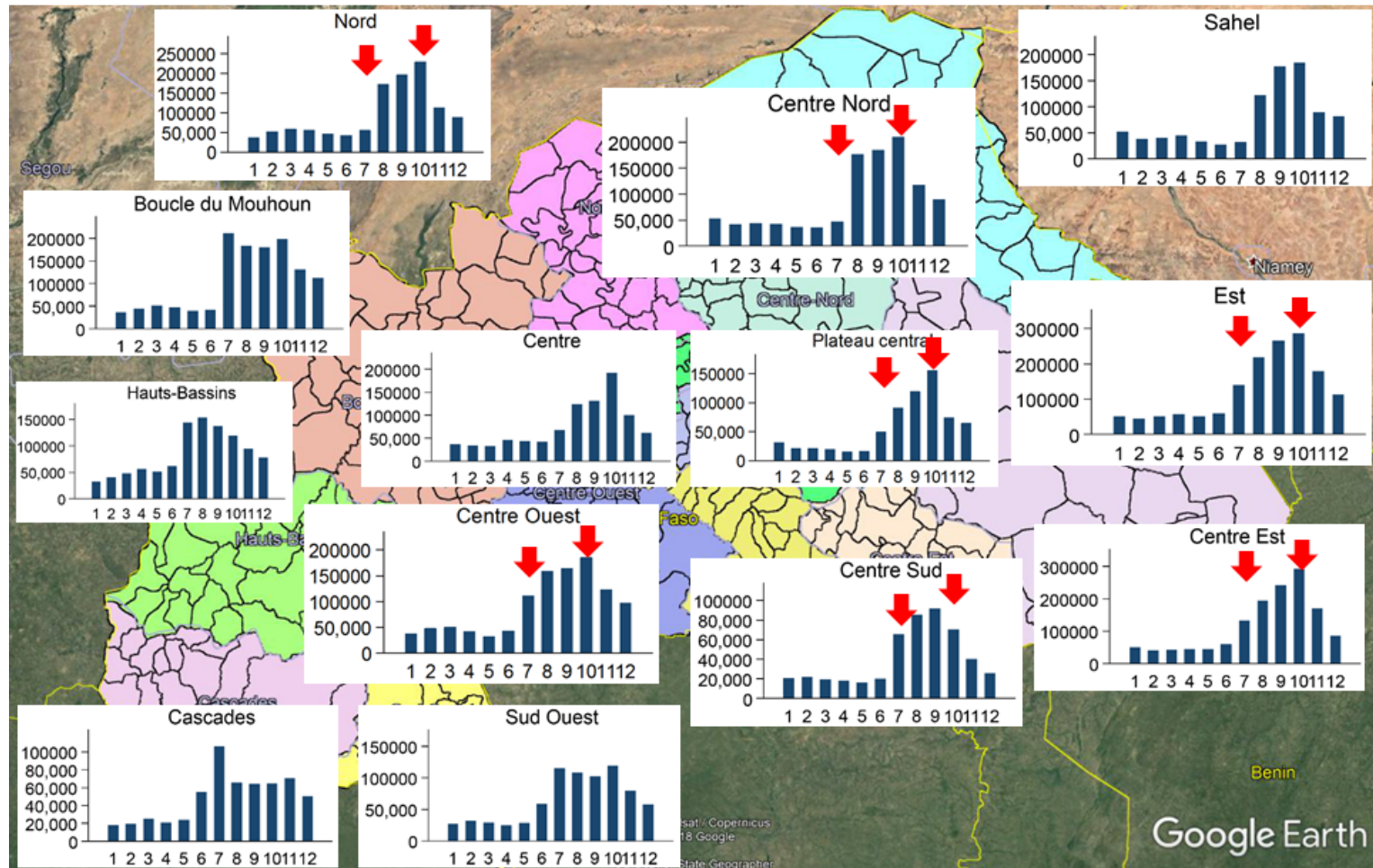
Table 3: Timing of cycles and surveys

Cycle	Distribution	Survey
1	July 28th-31st	August 17th-25th
2	August 24th-27th	September 11th-18th
3	September 20th-23rd	October 12th-19th
4	October 17th-20th	November 5th-19th

Summary of results from the four surveys

SMC coverage was assessed shortly after each cycle, to minimise any effect of recall bias. In cycle 1, 1,050 eligible children were surveyed, 1,567 in cycle 2, 1,692 in cycle 3 and 1,776 in cycle 4 (Table 4). Almost all of the surveyed children had been resident in their community for at least six months. SMC status could be verified from cards for 77.2 percent of children in cycle 1, 84.7 percent in cycle 2, 79.0 percent in cycle 3 and 87.9 percent in cycle 4. The percentage of children who had received SMC was 94.6 percent in cycle 1, 95.8 percent in cycle 2, 94.8 percent in cycle 3 and 95.9 percent in cycle 4. Over 90 percent of households each month said they were aware of the date of the SMC campaign in advance. Being aware of the date in advance was associated with a 3-fold increase in the odds of children receiving SMC from survey logistic regression (OR 3.0, 95%CI 1.7,5.2, adjusted for region and cycle number. See Figure 3).

Relationship between coverage and the number of doses administered

Delivery can potentially be monitored through administrative data once the number of treatments that have to be administered to achieve optimal coverage has been established. However, wastage, treatments given to older age groups, and population fluctuations, may affect the coverage achieved from a given number of treatments declared to have been administered on tally sheets. Figure 4 shows SMC coverage in relation to the number of doses administered in each cycle in each region. In Centre-Nord for example, a similar number of treatments was administered in each cycle, but the coverage achieved was 10 percent or so lower in cycle 1 than in the other cycles. In Centre-Est, fewer treatments were administered in cycles 3 and 4 than in the first two cycles, and coverage was lower in those cycles. This was related to a dispute between the health district administration and health facilities workers in Pouytenga district. In Est and Centre-Sud, coverage was stable in all 4 cycles and the number of treatments administered remained approximately constant. In Plateau-Central coverage dropped in cycle 2 although the number of treatments administered remained the same. (Administrative data should be checked for completeness before over-interpreting these results).

Comparison of estimates of mean coverage, and coverage per cycle, from the post-cycle surveys, and from the final survey

The mean coverage per cycle over the 4 cycles was 95.6 percent (95% confidence interval 93.8%,97.4%) from the post-cycle surveys. This compares with 96.3 percent (94.7%,97.8%) estimated from the final survey. This close agreement indicates, as has been found in Nigeria and Chad, that a survey at the end of the last cycle can be used to estimate mean coverage over the four cycles (Table 5). Table 6 and Figure 5 show the corresponding estimates for each cycle. The high level of card retention in Burkina Faso makes survey estimates of coverage less reliant on caregiver recall than in other countries, although there was evidence that dates are not always documented on cards so that it remains important to ask caregivers about treatment even when a card is available.

Table 4: Summary of key results from the 4 surveys. These results have been weighted for non-response and in each cycle include all children eligible for SMC at that cycle

Cycle	Clusters*	Household response rate[1]	Households aware of SMC date[2]	No. children surveyed[3]	No. eligible at the cycle[4]	% resident at least 6 months[5]	Card available[6]	Received SMC[7]	DoT[8]	Adherence[9]	% children over 6 who received SMC[10]
1	53	651/682 (95.5%)	91.1%	1,134	1,050	99.3%	77.2%	94.6%	96.8%	98.2%	#
2	54	1025/1105 (92.8%)	92.4%	1,971	1,567	99.2%	84.7%	95.8%	99.2%	99.5%	7.0%
3	55	1294/1341 (96.5%)	93.8%	2,110	1,692	99.8%	79.0%	94.8%	99.1%	99.5%	14.2%
4	55	1058/1222 (86.6%)	98.0%	2,108	1,776	99.3%	87.9%	95.9%	98.5%	99.6%	8.1%

*Clusters 14 and 18 were omitted from the cycle 1 survey, and cluster 18 was omitted from the cycle 2 survey.

1 Percentage of households who responded (households that didn't respond because they had no children under 7yrs, were excluded from the denominator)

2 Percentage of households where the respondent caregiver was aware of the campaign date in advance of the cycle

3 Children aged 3 months to 7 years were included in the survey

4 The number eligible for SMC based on their age, i.e. aged at least 3 months at the time of the cycle and aged less than 5 years at the time of cycle 1

5 % of those eligible, whose caregiver had lived in the village for at least 6 months before the survey

6 % of those eligible for whom the survey team were able to see the SMC card

7 % of eligible children who received the first dose of SMC

8 % whose first dose was administered by the CHW (as % of the children who were eligible and received SMC)

9 % of treated children whose caregiver said they administered both the second and third doses of AQ (% of eligible children who received SMC)

10 The percentage of children aged 6 years or more who received SMC

#estimate omitted as the cluster 1 survey did not systematically include children over 6yrs

(Note this table gives the 'complete' data for each survey, for comparisons between post-cycle and final survey estimates of coverage, analyses were limited to 53 clusters and to children who were eligible to receive 4 treatments (aged 3-59 months at cycle 1), and were not weighted for non-response).

Figure 3: Proportion of households aware of the campaign date in advance
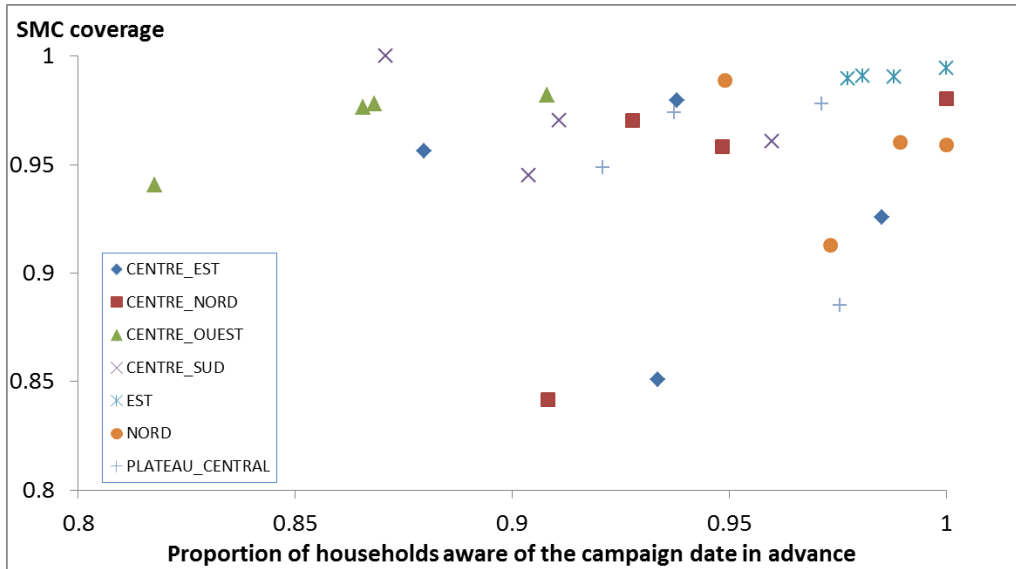
Children were more likely to receive SMC if the household was aware of the date of the campaign in advance. It may be that in areas where there were delivery problems, delivery and communication were both adversely affected by other factors, however it has been a consistent finding that when households are aware of the day of SMC in advance coverage is better. Being aware of the date in advance was associated with a 3-fold increase in the odds of children receiving SMC from survey logistic regression (OR 3.0, 95%CI 1.7,5.2, adjusted for region and cycle number).

Figure 4: SMC coverage in relation to the number of doses administered in each cycle in each region
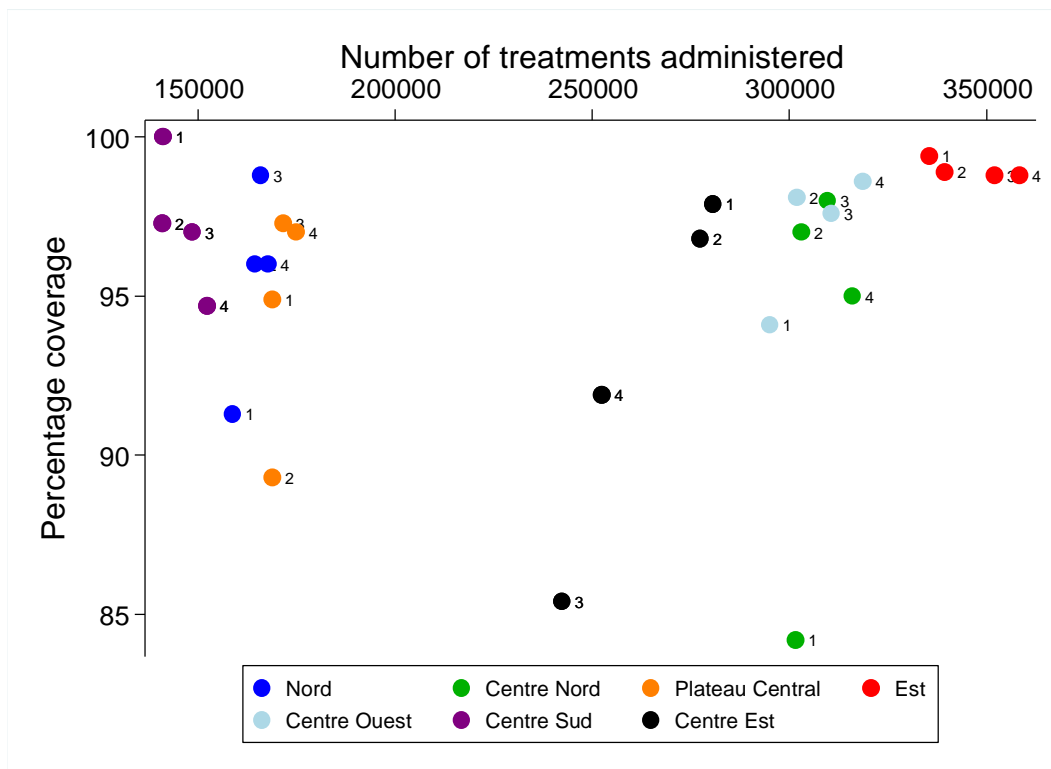
Table 5: Estimates of mean coverage per cycle from the post-cycle surveys, and from the final survey (children eligible for 4 treatments, 53 clusters visited in all surveys)

	Mean coverage per cycle, cycles 1-4		
Region	Post-cycle surveys (95%CI)	Final survey (95%CI)	Difference (95%CI)
Centre Est	92.9% (86.9%,99.0%)	94.9% (90.4%,99.3%)	1.91% (-2.75%,6.57%)
Centre Nord	94.6% (90.1%,99.0%)	94.4% (90.3%,98.5%)	-0.15% (-2.06%,1.76%)
Centre Ouest	97.2% (95.3%,99.1%)	97.8% (96.0%,99.5%)	0.58% (-1.57%,2.73%)
Centre Sud	97.0% (92.4%,101.5%)	94.5% (87.5%,101.5%)	-2.47% (-6.55%,1.62%)
Est	98.9% (97.6%,100.3%)	98.0% (96.5%,99.6%)	-0.93% (-3.13%,1.27%)
Nord	96.0% (93.3%,98.7%)	97.2% (95.5%,98.8%)	1.13% (-6.63%,8.88%)
Plateau Central	94.7% (91.9%,97.5%)	98.2% (96.5%,100.0%)	3.54% (-0.80%,7.88%)
TOTAL	95.6% (93.8%,97.4%)	96.3% (94.7%,97.8%)	0.70% (-0.59%,1.99%)

Table 6: Comparison of the coverage estimates each month obtained from the final survey and from post-cycle surveys

	Post cycle survey (95%CI)	Final survey (95%CI)	Difference (95%CI)
Cycle 1			
TOTAL	94.6% (91.4%,97.7%)	95.5% (93.4%,97.6%)	0.95% (-1.33%,3.23%)
Centre Est	97.9% (95.2%,99.1%)	97.1% (94.9%,98.4%)	-0.82% (-3.81%,2.18%)
Centre Nord	84.2% (62.8%,94.4%)	88.7% (77.1%,94.8%)	4.54% (-4.04%,13.11%)
Centre Ouest	94.1% (86.5%,97.5%)	97.1% (93.8%,98.7%)	3.03% (-2.02%,8.09%)
Centre Sud	100.0% (,)	91.8% (71.1%,98.1%)	-8.24% (-25.72%,9.24%)
Est	99.4% (96.3%,99.9%)	98.8% (95.5%,99.7%)	-0.60% (-2.48%,1.28%)
Nord	91.3% (81.2%,96.2%)	95.4% (91.8%,97.5%)	4.13% (-20.50%,28.76%)
Plateau Central	94.9% (88.8%,97.7%)	97.7% (93.8%,99.2%)	2.86% (-4.50%,10.22%)
Cycle 2			
TOTAL	96.3% (94.4%,97.5%)	97.4% (95.9%,98.4%)	1.19% (-0.65%,3.03%)
Centre Est	96.8% (92.5%,98.6%)	96.8% (90.6%,98.9%)	0.01% (-5.15%,5.18%)
Centre Nord	97.0% (90.5%,99.1%)	96.0% (89.8%,98.5%)	-0.99% (-4.40%,2.42%)
Centre Ouest	98.1% (95.5%,99.2%)	98.3% (95.5%,99.3%)	0.18% (-1.40%,1.75%)
Centre Sud	97.3% (90.9%,99.3%)	96.3% (90.4%,98.6%)	-1.07% (-4.83%,2.69%)
Est	98.9% (92.6%,99.8%)	98.8% (95.4%,99.7%)	-0.10% (-3.60%,3.41%)
Nord	96.0% (93.7%,97.5%)	97.6% (95.6%,98.7%)	1.55% (-6.30%,9.41%)
Plateau Central	89.3% (83.1%,93.5%)	98.8% (96.1%,99.6%)	9.45% (1.19%,17.71%)
Cycle 3			
TOTAL	94.8% (88.8%,97.7%)	96.1% (92.7%,97.9%)	1.29% (-2.13%,4.71%)
Centre Est	85.4% (62.7%,95.3%)	91.8% (76.7%,97.4%)	6.34% (-8.13%,20.81%)
Centre Nord	98.0% (90.8%,99.6%)	97.5% (94.6%,98.8%)	-0.52% (-4.00%,2.95%)
Centre Ouest	97.6% (93.7%,99.1%)	97.2% (91.5%,99.1%)	-0.34% (-4.59%,3.90%)
Centre Sud	97.0% (82.4%,99.6%)	95.1% (85.6%,98.5%)	-1.88% (-4.17%,0.41%)
Est	98.8% (91.8%,99.8%)	96.8% (92.8%,98.6%)	-1.97% (-5.19%,1.25%)
Nord	98.8% (93.8%,99.8%)	99.2% (91.8%,99.9%)	0.36% (-3.31%,4.03%)
Plateau Central	97.3% (89.5%,99.3%)	99.3% (96.4%,99.9%)	2.06% (-4.51%,8.64%)

Figure 5: Coverage in each region and cycle. Open symbols show overall mean for each cycle across all regions
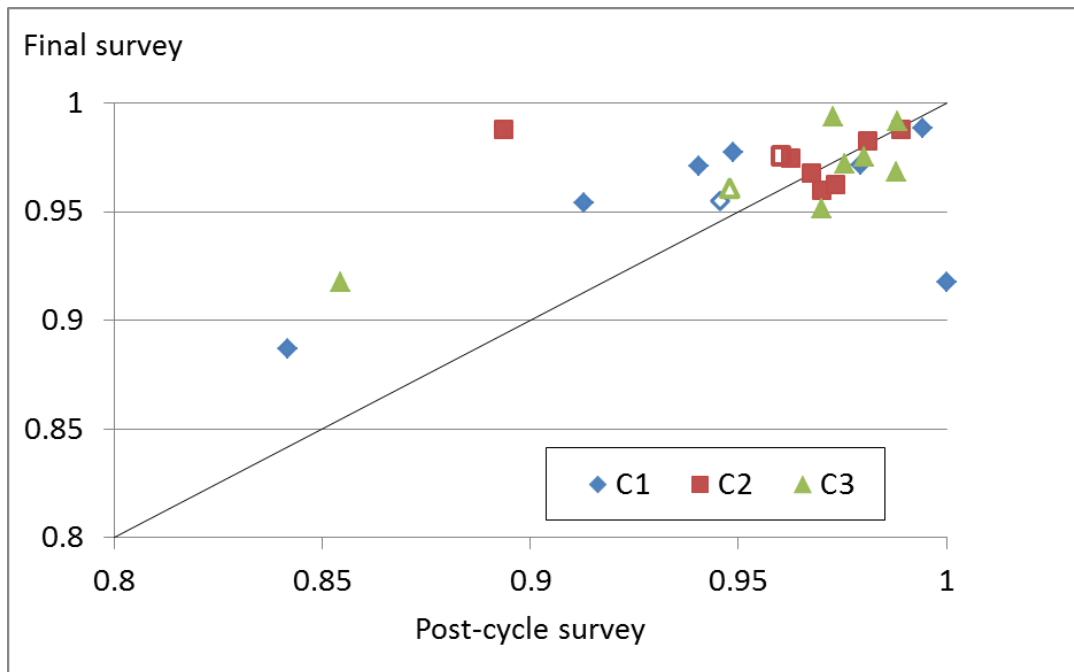
Results of the cycle 1 survey

The cycle 1 survey took place from August 17th-25th shortly before cycle 2. Two of the 55 clusters (14 and 18) were not visited. 651/682 households participated a response rate of 95.5 percent. The reasons for non-response were: no children in the survey age range, or the interview could not access the compound or could not find a responsible adult to seek permission. 1,134 children were included, of whom 1,050 were eligible to have received SMC at cycle 1. Ninety-one percent of households were aware of the date of the campaign in their village in advance. Criers (town announcers) were the most common source of information (58 percent of households, Table 7). Nearly ninety-six percent (95.8) of eligible children received SMC (Table 8), and for 99 percent of these treatments the first dose was administered by the CHW. A total of 77 caregivers gave reasons for their child missing SMC treatment (Table 9): the most common reasons for missed treatment was that the child was unwell, or the caregiver was away on the day of the campaign. Reported adherence was high, with 98.2 percent of treated children completing the course of treatment, according to the caregiver. Due to misunderstanding by the field team, the cycle 1 survey did not systematically include children 6-7 years of age so treatment of older children could not be assessed at cycle 1.

Table 7: Percentage of households aware of the date of the cycle 1 campaign in advance, and the sources of the information

Region	% households aware of the date of the campaign in advance	Source of information (% of households)						
		Friends/ neighbours	Health worker	Crier	Posters	Radio	TV	Mosque/ Church
Centre Est	93.8%	23.4%	63.6%	70.8%	0.6%	4.9%	3.7%	23.7%
Centre Nord	90.8%	12.3%	77.8%	23.3%	0.0%	4.2%	4.6%	8.4%
Centre Ouest	81.8%	25.0%	14.2%	57.6%	2.8%	2.0%	1.6%	8.7%
Centre Sud	87.1%	6.6%	15.7%	69.2%	2.0%	8.1%	3.5%	21.0%
Est	100.0%	5.9%	38.6%	67.4%	0.0%	9.9%	1.0%	12.9%
Nord	97.3%	54.1%	76.6%	63.2%	0.0%	1.6%	0.0%	1.6%
Plateau Central	92.1%	18.1%	39.6%	54.6%	0.0%	4.4%	0.0%	17.6%
TOTAL	91.1%	20.0%	45.7%	58.0%	0.9%	4.8%	2.3%	14.0%

Table 8: Percentage of children who received SMC, coverage by gender, and percentage of doses that were administered by the CHW at cycle 1

Region	% children received SMC	Males	Females	% first doses administered DoT
Centre Est	97.9%	96.7%	99.2%	99.2%
Centre Nord	84.2%	83.7%	84.7%	97.3%
Centre Ouest	94.1%	94.3%	93.8%	90.1%
Centre Sud	100.0%	100.0%	100.0%	94.8%
Est	99.4%	100.0%	99.0%	98.9%
Nord	91.3%	95.5%	87.6%	100.0%
Plateau Central	94.9%	92.4%	97.5%	100.0%
TOTAL	94.6%	94.1%	95.0%	96.8%

Table 9: Reasons for missed treatments at cycle 1

Reason	No. of respondents	%
Child unwell	29	37.7%
Caregiver or child away	24	31.2%
Problems at the distribution point	7	9.1%
No drugs available	6	7.8%
Child outside age range	2	2.6%
Caregiver not aware of SMC	3	3.9%
Don't know	6	7.8%
Total	77	100.0%

Results of the cycle 2 survey

The cycle 1 survey took place from September 11th-18th shortly before cycle 3. One of the 55 clusters (18) were not visited. 1,025/1,105 households participated, a response rate of 92.8 percent. The reasons for non-response were: no children in the survey age range, or the interviewer could not access the compound or could not find a responsible adult to seek permission. 1,971 children were included, of whom 1,567 were eligible to have received SMC at cycle 1. Nearly all of these children (99.2 percent)had been resident in the village for the last six months. A high proportion (92.4 percent) of households were aware of the date of the campaign in their village in advance (Table 10). Health workers were the most common source of information (56 percent of households), followed by criers (36 percent). An SMC card was available for 84.7 percent of eligible children. A total of 95.8 percent of eligible children received SMC (Table 11). For 99 percent of these treatments the first dose was administered by the CHW. A total of 54 caregivers gave reasons for their child missing SMC treatment (Table 12): the most common reasons for missed treatment were that the child was unwell, or the caregiver was away on the day of the campaign. Reported adherence was high, with 99.5 percent of treated children completing the course of treatment, according to the caregiver. A small but significant proportion of children aged 6-7 years received SMC (7 percent).

Table 10: Percentage of households aware of the date of the cycle 2 campaign in advance, and the sources of the information

Region	% households aware of the date of the campaign in advance	Source of information (% households)						
		Friends/ neighbours	Health worker	Crier	Radio	TV	Mosque/ Church	Other
Centre Est	88.0%	10.8%	59.2%	27.8%	1.8%	0.0%	0.4%	0.0%
Centre Nord	92.8%	0.6%	77.2%	19.4%	0.7%	0.7%	1.4%	0.0%
Centre Ouest	86.8%	1.1%	40.9%	53.7%	0.7%	0.8%	2.2%	0.7%
Centre Sud	96.0%	6.2%	14.1%	72.5%	2.7%	2.6%	1.0%	0.9%
Est	98.1%	1.6%	86.3%	10.0%	0.0%	0.0%	2.1%	0.0%
Nord	98.9%	7.5%	81.3%	10.8%	0.0%	0.0%	0.0%	0.5%
Plateau Central	97.6%	7.6%	36.6%	55.8%	0.0%	0.0%	0.0%	0.0%
TOTAL	92.4%	5.3%	55.8%	36.2%	0.9%	0.5%	1.1%	0.2%

Table 11: Percentage of children who received SMC, and percentage of doses that were administered by the CHW at cycle 2

	% children received SMC	% treatments DoT
Centre Est	95.6%	99.7%
Centre Nord	97.0%	99.2%
Centre Ouest	97.8%	97.6%
Centre Sud	96.1%	100.0%
Est	99.1%	99.6%
Nord	96.0%	99.0%
Plateau Central	88.5%	100.0%
TOTAL	95.8%	99.2%

Table 12: Reasons for missed treatments at cycle 2

Reason	No. of respondents	%
Caregiver away	24	44.4%
Child unwell	15	27.8%
Child outside age range	9	16.7%
No drugs available	3	5.6%
Caregiver did not know about SMC	3	5.6%
TOTAL	54	100%

Results of the cycle 3 survey

The cycle 3 survey took place from October 12th-19th just before cycle 4. All 55 clusters were visited. 1,294/1,341 households participated, a response rate of 96.5 percent. The reasons for non-response were: no children in the survey age range, or the interviewer could not access the compound or could not find a responsible adult to seek permission. 2,110 children were included, of whom 1,692 were eligible to have received SMC at cycle 1. Nearly all of these children (99.8 percent) had been resident in the village for the last six months. A high proportion (93.8 percent) of households were aware of the date of the campaign in their village in advance (Table 13). Health workers were the most common source of information (75 percent of households); criers were less used than in earlier cycles. Only 15 percent of households said they heard about the date of the campaign from a village crier. An SMC card was available for 79 percent of eligible children. A total of 94.8 percent of eligible children received SMC (Table 14). For 99 percent of these treatments the first dose was administered by the CHW. A total of 68 caregivers gave reasons for their child missing SMC treatment (Table 15). The most common reason given for missed treatment was problems with SMC distribution in the district. Reported adherence was high, with 99.5 percent of treated children completing the course of treatment, according to the caregiver. A significant proportion of children aged 6-7 years received SMC (14 percent).

Table 13: Percentage of households aware of the date of the cycle 3 campaign in advance, and the sources of the information

Region	% households aware of the date of the campaign in advance	Banners/ posters	Friends/ neighbours	Health worker	Mosque/ Church	Other	Crier	Radio	TV
				Source of information					
Centre Est	93.4%	0.4%	2.0%	67.8%	0.0%	1.3%	24.1%	4.4%	0.0%
Centre Nord	100.0%	0.0%	4.9%	77.7%	0.0%	3.8%	10.9%	1.1%	1.6%
Centre Ouest	86.6%	0.0%	5.1%	72.7%	0.0%	0.0%	22.2%	0.0%	0.0%
Centre Sud	91.1%	0.0%	10.1%	57.2%	6.1%	0.0%	26.7%	0.0%	0.0%
Est	97.7%	0.0%	0.0%	89.4%	2.3%	0.0%	3.1%	5.2%	0.0%
Nord	94.9%	0.0%	18.9%	81.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Plateau Central	93.7%	0.0%	11.4%	78.5%	3.7%	0.0%	6.4%	0.0%	0.0%
TOTAL	93.8%	0.1%	5.5%	74.9%	1.2%	1.0%	14.9%	2.1%	0.3%

Table 14: Percentage of children who received SMC, and percentage of doses that were administered by the CHW at cycle 3

Region	% children received SMC	% treatments DoT
Centre Est	85.1%	84.9%
Centre Nord	98.0%	98.0%
Centre Ouest	97.6%	94.5%
Centre Sud	97.0%	94.9%
Est	99.0%	99.0%
Nord	98.9%	99.5%
Plateau Central	97.4%	96.4%
TOTAL	94.8%	94.0%

Table 15: Reasons for missed treatments at cycle 3

Reason	No of respondents	%
Problems with SMC in the district	28	41.2%
Problems at the distribution point	23	33.8%
Caregiver or child away	10	14.7%
Unable to take child to the health worker	5	7.4%
Forgot	1	1.5%
Child outside age range	1	1.5%
TOTAL	68	100.0%

Results of the final survey

The final survey took place from November 5th-17th. All 55 clusters were visited. 1,058/1,222 households participated, a response rate of 86.6 percent. The reasons for non-response were: no children in the survey age range, or the interview could not access the compound or could not find a responsible adult to seek permission. 2,108 children were included of whom 1,776 were eligible to have received SMC at cycle 4. Nearly all (99.3 percent) of these children had been resident in the village for the last six months, and the majority (98 percent) of households were aware of the date of the campaign in their village in advance (Table 16). Health workers were the most common source of information (81 percent of households) followed by criers (51 percent). An SMC card was available for 87.9 percent of eligible children. A total of 95.9 percent of eligible children received SMC (Table 17). For 98.5 percent of these treatments the first dose was administered by the CHW. A total of 68 caregivers gave reasons for their child missing SMC treatment (Table 18): the most common reasons for missed treatment was given as "problems with SMC distribution" in the district, referring to dispute between the health district administration and health facilities workers in Pouytenga district. Reported adherence was high, with 99.6 percent of treated children completing the course of treatment, according to the caregiver. Only a small proportion of children aged 6-7 years received SMC (8.1 percent).

Table 16: Percentage of households aware of the date of the cycle 4 campaign in advance, and the sources of the information

Region	Household aware about SMC	Heard the date of cycle 4	From friends/neighbour	From a health worker	From a crier	From posters	On the radio	On TV
Centre-Est	98.9	98.9	2.2	67.7	57.0	2.5	9.9	0.7
Centre-Nord	96.1	96.1	11.3	84.5	24.6	0.7	1.3	0.0
Centre-Ouest	96.5	91.8	16.0	81.5	42.0	0.0	10.0	3.5
Centre-Sud	93.6	92.1	20.2	59.7	56.8	2.3	9.1	4.5
Est	100.0	99.4	4.0	95.0	57.8	0.0	8.0	0.0
Nord	100.0	100.0	56.6	98.8	50.2	1.2	1.7	1.2
Plateau-Central	100.0	98.1	7.6	89.0	67.5	4.1	32.7	1.6
Total	98.0	96.7	11.9	80.9	50.6	1.5	10.5	1.5

Table 17: Percentage of children who received SMC, and percentage of of doses that were administered by the CHW at cycle 4

Region	Percentage treated	Percentage who received all 3 daily doses	Number of children aged 3-59 months
Centre-Est	91.9	99.8	420
Centre-Nord	95.0	100.0	273
Centre-Ouest	98.6	98.6	305
Centre-Sud	94.7	100.0	135
Est	98.8	100.0	335
Nord	96.0	99.4	110
Plateau-Central	97.0	99.5	198
Total	**95.9**	**99.6**	**1776**

Table 18: Reasons for missed treatments at cycle 4

Reason	No. of respondents	%
Problems with SMC in the district	24	35.3%
Child was unwell	23	33.8%
Caregiver or child was away	18	26.5%
Child outside age range	3	4.4%
TOTAL	68	100.0%

Caregiver knowledge about seasonal malaria chemoprevention

Caregivers were asked 10 questions about their understanding of SMC. The questions covered: the purpose of SMC and whether it can prevent malaria or malaria and other diseases, the number of tablets to be taken each day, the number of months a child should receive SMC, the importance of adherence and completing the treatment course, the need to seek care if the child becomes unwell, and not to use the tablets to treat another person or someone who is unwell. Most of the questions were answered correctly. Q3 (SMC can prevent other diseases) was answered less well, with only 69 percent of caregivers giving the correct answer.

Table 19: Caregivers' knowledge scores on SMC:#

Question	Correct answer
1) For how many months should the child take SMC	4
2) SMC is given to prevent malaria	Yes
3) SMC can prevent other diseases	No
4) How many tablets should the child take on the first day?	2
5) How many tablets should the child take on the second day?	1
6) How many tablets should the child take on the third day?	1
7) The child should swallow all the medication	Yes
8) I can give the tablets to someone else who is unwell	No
9) The child should complete the 3-day course of treatment	Yes
10) I should take the child to the health centre if unwell after SMC	Yes

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Centre Est	90.2%	98.9%	92.8%	97.4%	99.2%	99.2%	89.9%	89.2%	98.5%	98.1%
Centre Nord	68.0%	97.4%	32.9%	98.4%	98.9%	98.0%	97.1%	83.3%	94.8%	96.5%
Centre Ouest	74.3%	99.6%	67.8%	96.1%	96.9%	95.9%	88.4%	76.0%	96.0%	97.2%
Centre Sud	82.2%	100.0%	55.0%	99.2%	96.5%	94.2%	96.9%	86.2%	98.4%	99.2%
Est	97.1%	99.4%	77.4%	97.3%	99.4%	99.4%	89.1%	73.4%	97.2%	98.9%
Nord	54.8%	99.4%	32.9%	96.2%	96.2%	95.0%	100.0%	64.3%	99.4%	100.0%
Plateau Central	88.7%	99.0%	81.1%	96.5%	98.1%	97.1%	42.7%	88.6%	97.3%	98.1%
TOTAL	82.2%	99.0%	68.9%	97.3%	98.2%	97.5%	86.6%	81.8%	97.2%	98.0%

Table 20: Caregivers' knowledge scores on SMC

Region	Average caregiver knowledge score (out of 10)	Average reported CHW score for adherence to guidelines (out of 8)
Centre-Est	9.5	7.8
Centre-Nord	8.6	7.8
Centre-Ouest	8.8	7.4
Centre-Sud	9.0	7.6
Est	9.3	7.9
Nord	8.8	6.8
Plateau-Central	8.9	7.8
Total	9.1	7.6

Adherence by health workers to seasonal malaria chemoprevention guidelines as reported by caregivers

When caregivers were asked about the steps followed by the health worker when they visited for SMC at cycle 4, over 90 percent of caregivers said the health worker checked the child's age and explained about administering the tablets, checked for fever, and asked if the child had taken other medications in the last month or had allergies to any medicines. The mean overall score of 7.6 on an 8-point scale was higher than in other countries where the same questionnaire has been used.

Table 21: CHW adherence to guidelines

Action	% of households who reported that the CHW performed the action at the last visit:
1 Check the child's age	99.2
2 Explain how to administer tablets	99.2
3 Check for illness or fever	94.8
4 Explain the common side effects of SMC drugs	88.3
5 Advise to bring the child to the health centre if they are unwell	98.1
6 Ask if the child had taken other medicines in the last 4 weeks	97.9
7 Ask if the child had side effects to SMC before	90.6
8 Ask about allergies to medicines	92.5

Directly observed treatment (DOT)

The dose of SP and the first dose of AQ were administered by the health worker for 98.5 percent children. Almost all caregivers said they administered the second and third doses of amodiaquine (Table 22). The reasons given by the small number of caregivers who did not give the doses of amodiaquine on day two or three, were that they (the caregiver) were away, were too busy, forgot or did not understand the need to give the second and third dose.

Table 22: Out of those who received SMC at cycle 4, the percentage whose first dose was administered by the CHW, the percentage that received the second dose, and the percentage that received the third dose

Region	First dose administered by the CHW	Second dose given	Third dose given
Centre-Est	97.5	99.8	99.8
Centre-Nord	98.6	100.0	100.0
Centre-Ouest	98.3	99.0	98.6
Centre-Sud	99.2	100.0	100.0
Est	100.0	100.0	100.0
Nord	99.4	99.4	99.4
Plateau-Central	97.0	99.5	99.5
Total	**98.5**	**99.7**	**99.6**

Time taken to receive seasonal malaria chemoprevention

The household member present during SMC administration was the mother in 96 percent of cases (Table 23). Of those who responded about the time spent waiting for the health worker to come, and the time taken to administer SMC in the household, most reported they waited less than one hour, and said the CHW spent less than 15 minutes at the household, with few reporting that SMC administration for the household took more than 30 minutes (Table 24).

Table 23: Percent of Households who waited with the child

Who waited with the child	% of households
Aunt	0.4
Father	1.3
Grandfather	0.1
Grandmother	1.7
Mother	96.3
Sister	0.1
Uncle	0.1

Table 24: Time spent waiting

How do you rate the time spent waiting in total:	% of households
Long	4.4
Neither Short Nor Long	35.4
Short	39.8
Very Long	2.1
Very Short	18.3
Time spent waiting for the CHW:	
Less than 1 hour	58.2
1-2 hours	27.5
Up to half a day	4.2
A full day	0.6
Don't know	9.5
Time taken to administer SMC in the household:	
Less than 15 minutes	63.8
15-30 minutes	22.8
30 minutes - 1 hour	2.9
1-2 hours	1.7
Long wait of more than 2hrs	1.0
Don't know	7.9

Coverage of seasonal malaria chemoprevention at each cycle as determined from the final survey

Coverage among children eligible to receive four treatments was over 95 percent in each cycle (Table 25). Coverage was slightly lower in Centre Est in cycles 3 and 4, and in Centre Nord in cycle 1.

Table 25: SMC coverage among children eligible for four treatments, by region

Region	Mean number of treatments	% that received SMC at each cycle:			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
Centre-Est	3.77	97.3	97.1	91.5	90.9
Centre-Nord	3.74	87.6	95.6	97.2	93.9
Centre-Ouest	3.91	97.4	98.5	97.4	98.1
Centre-Sud	3.80	92.7	96.4	95.5	95.5
Est	3.96	99.6	99.6	97.8	98.5
Nord	3.88	95.3	97.5	99.2	96.1
Plateau-Central	3.93	98.3	98.8	99.3	96.6
TOTAL	**3.85**	**95.9**	**97.8**	**96.3**	**95.3**

Coverage was equitable (Table 26) with, in each cycle, similar levels of coverage in each socio-economic group. Coverage was similar in boys and girls (Table 27).

Table 26: SMC coverage among children eligible for four treatments, by socioeconomic ranking

Wealth ranking	Mean number of treatments	% that received SMC at each cycle:			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
Lowest	3.80	93.0	94.9	95.2	96.4
Low	3.80	93.4	97.5	95.5	93.2
Middle	3.83	96.6	96.9	94.7	95.0
High	3.83	94.1	97.9	96.1	94.7
Highest	3.75	92.6	93.7	94.6	94.2

Table 27: SMC coverage among children eligible for four treatments, by gender

Gender	Mean number of treatments	% that received SMC at each cycle:			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
Female	3.86	95.7	97.7	96.7	95.7
Male	3.85	96.1	97.8	95.9	94.9

The majority (90.5 percent) of children received SMC on four occasions, while only 0.3 percent of children did not receive SMC at all (Table 28). Table 29 shows the number of children according to the pattern of monthly treatments they received.

Table 28: Number of SMC treatments: percentage of children who received SMC 0,1,2,3,or 4 times

Region	% children who received SMC 0,1,2,3,4 times				
	0	1	2	3	4
Centre-Est	0.0	1.0	6.9	6.1	85.9
Centre-Nord	0.4	1.5	3.3	12.7	82.0
Centre-Ouest	0.0	0.8	1.1	4.1	94.0
Centre-Sud	2.7	1.8	0.0	3.7	91.8
Est	0.0	0.4	0.0	3.3	96.4
Nord	0.0	0.3	2.5	6.1	91.2
Plateau-Central	0.7	0.0	0.5	3.2	95.6
TOTAL	0.3	0.8	2.6	5.7	90.5

Table 29: Percentage of children by SMC cycles received

Received SMC at cycle:				
1	2	3	4	% of children
0	0	0	0	0.3
0	0	0	1	0.4
0	0	1	0	0.0
0	1	0	0	0.1
1	0	0	0	0.3
1	1	0	0	1.4
1	0	1	0	0.1
1	0	0	1	0.2
0	1	1	0	0.2
0	1	0	1	0.2
0	0	1	1	0.7
1	1	1	0	2.3
1	1	0	1	1.4
1	0	1	1	0.2
0	1	1	1	2.4
1	1	1	1	90.5

Of children aged 6-7 years, 9.4 percent had received an SMC card. The percentage of this older group who were treated varied between regions, and treatment of older children was reported in only three regions: Plateau Central, Centre Est and Centre Sud (Table 30).

Table 30: Treatment of children above the age limit for SMC (aged 6-7 years at the survey)

Region	Mean number of treatments	% Treated at cycle:				Given an SMC card	Number surveyed
		Cycle 1	Cycle 2	Cycle 3	Cycle 4		
Centre-Est	0.5	13.3	13.3	13.3	13.3	8.7	23
Centre-Nord	0.0	0.0	0.0	0.0	0.0	0.0	13
Centre-Ouest	0.0	0.0	0.0	0.0	0.0	9.2	30
Centre-Sud	0.9	7.8	15.7	31.4	31.4	31.4	13
Est	0.0	0.0	0.0	0.0	0.0	0.0	10
Nord	0.0	0.0	0.0	0.0	0.0	0.0	10
Plateau-Central	0.6	15.9	15.9	15.9	11.9	12.1	25
Overall	**0.3**	**6.5**	**7.3**	**8.9**	**8.1**	**9.4**	**124**

Most children had received an SMC card (Table 31), and a high proportion (88%) had the card available for inspection at the survey.

Table 31: Percentage of eligible children who received an SMC card, and the percentage with a card available for inspection during the survey

Region	Given SMC card	Card available for inspection
Centre-Est	97.7	83.8
Centre-Nord	97.7	97.4
Centre-Ouest	99.3	88.1
Centre-Sud	96.4	85.6
Est	97.1	93.0
Nord	95.9	98.0
Plateau-Central	99.3	71.6
TOTAL	97.8	87.9

When agreement between caregiver recall about the monthly SMC treatments, and the card record, was compared for children who had a card, percentage agreement was high, but poorer at cycle 4 where treatments were less likely to be written on the card. The kappa values (measuring the degree of agreement beyond chance agreement) ranged from 0.63 at cycle 1 to 0.37 at cycle 4, (Table 32).

Table 32: Agreement between caregiver report and SMC card

Cycle	Card 0 Carer 0	Card 1 Carer 1	Card 0 Carer 1	Card 1 Carer 0	% Agreement	kappa*
1	92	1418	77	19	94.0	0.626
2	59	1467	73	7	95.0	0.573
3	78	1408	114	6	92.5	0.531
4	85	1292	224	5	85.7	0.372

*kappa measures agreement beyond what would be expected by chance, values below 0.4 are considered poor agreement (*Fleiss, J.L. (1981). Statistical methods for rates and proportions (2nd ed.). New York: John Wiley.*)

Bed net coverage:

Ninety-five percent of children eligible for SMC slept under a bednet the night before the survey (Table 33). A roster of all household members was made and each sleeping place inspected. Ninety-one percent of all household members slept under a net (Table 34). The type of nets was not recorded;, all nets were long-lasting insecticide-treated nets (LLINs).

Table 33: Percentage of children 3-59 months who slept under a bed net (of any type) the night before the survey

Region	Slept under a net (of any type) last night
Centre-Est	93.1
Centre-Nord	99.7
Centre-Ouest	93.6
Centre-Sud	93.9
Est	99.7
Nord	92.7
Plateau-Central	92.0
TOTAL	95.3

Table 34: Percentage who slept under a bed net, out of those who slept in the household the night before the survey, by region

Region	Any net	Intact net	Net <2yrs old	No. surveyed
Centre-Est	92.8	42.0	43.0	1356
Centre-Nord	95.0	21.5	0.3	961
Centre-Ouest	90.3	30.9	21.8	1048
Centre-Sud	85.8	46.3	7.3	521
Est	99.4	16.3	0.0	824
Nord	77.3	51.9	5.0	418
Plateau-Central	92.1	56.8	37.9	684
TOTAL	91.6	36.3	19.4	5812

Coverage was slightly lower among adolescents than in other age groups (Table 35). Coverage varied by region, being lower in Nord and Centre Sud. Coverage was similar in all socioeconomic groups (Table 36). There was no difference in coverage by gender (Table 37).

Table 35: Percentage who slept under a bed net, out of those who slept in the household the night before the survey, by age group

Age	Any net	Intact net	Net <2yrs old	No. surveyed
<10yrs	92.5	35.8	19.9	2,605
10-14yrs	85.0	29.5	17.7	608
15-19yrs	85.5	33.7	17.9	347
20-24yrs	93.6	38.5	20.6	348
25-30yrs	94.0	41.1	23.4	452
30-39yrs	94.7	40.4	20.9	742
40+yrs	92.6	37.4	15.5	691
TOTAL	91.8	36.4	19.5	5,793

Table 36: Percentage who slept under a bed net, out of those who slept in the household the night before the survey, by wealth ranking

Wealth quintile	Any net	Intact net	Net <2yrs old	No. surveyed
Lowest	88.9	24.8	18.2	584
Low	91.6	32.4	12.8	955
Middle	93.8	33.8	17.6	1,365
High	90.8	41.1	17.7	1,459
Highest	91.0	41.6	29.5	1,378

Table 37: Percentage who slept under a bed net, out of those who slept in the household the night before the survey, by gender

Gender	Any net	Intact net	Net <2yrs old	No. surveyed
Male	90.2	36.8	18.2	2,665
Female	93.1	36.0	20.5	3,134

Access to a net (the percentage of the population that could sleep under a net if one net was shared between two people) was 95.6 percent (Table 38). 96.5 percent of households had at least one bed net (Table 39).

Table 38: Percentage of the population who could sleep under a net if two people slept under each net (values in the main part of the table are row percentages)

No. who slept in the household last night	No. of nets in the household*:									No. of households	% could sleep under net if 2/net
	0	1	2	3	4	5	6	7	8+		
1	41.8	25.8	10.1	11.3	0.0	11.0	0.0	0.0	0.0	9	58.2
2	2.3	0.0	81.4	13.6	2.7	0.0	0.0	0.0	0.0	37	97.7
3	4.2	0.0	3.0	91.7	0.6	0.6	0.0	0.0	0.0	177	95.8
4	3.3	0.0	0.5	3.8	88.5	3.9	0.0	0.0	0.0	200	96.7
5	3.5	0.0	0.0	1.9	4.5	87.5	2.6	0.0	0.0	151	96.5
6	0.8	0.0	1.4	3.5	2.6	3.9	87.9	0.0	0.0	129	98.8
7	4.3	0.0	1.2	2.0	3.2	4.4	8.8	76.1	0.0	85	94.9
8+	3.0	0.0	0.6	1.4	1.9	4.2	4.8	59.8	24.3	215	93.3
TOTAL	**3.5**	**0.2**	**4.1**	**18.8**	**19.2**	**16.1**	**13.1**	**19.6**	**5.3**	**1003**	**95.6**

*the majority of nets are LLINs

Table 39: Percentage of households with at least one net, and the percentage with one net per 2 household members

Region	Net of any type		Intact net		Net <2yrs old		No. of households
	1 or more	At least 1 per 2	1 or more	At least 1 per 2	1 or more	At least 1 per 2	
Centre-Est	95.9	94.7	48.8	44.8	44.8	42.3	253
Centre-Nord	97.2	97.2	24.8	22.8	0.6	0.6	151
Centre-Ouest	96.1	93.3	41.9	37.3	24.7	23.5	176
Centre-Sud	95.6	93.3	58.3	50.7	11.3	10.2	91
Est	98.2	98.2	24.5	16.6	0.0	0.0	165
Nord	96.1	86.5	67.8	53.8	11.6	0.0	49
Plateau-Central	95.8	94.7	66.7	65.5	39.4	39.4	118
TOTAL	96.5	94.7	44.5	39.4	21.9	20.2	1,003

Adverse events

Caregivers were asked if the child had been unwell since SMC treatment. Ninety-four children (5.3 percent) were reported to have been unwell since they received SMC at cycle 4 (Table 41). The symptoms were fever (83 children), vomiting (24 children), diarrhoea (23 children), yellow eyes (four children), abdominal pain (11), loss of appetite (16) and drowsiness (9). While the link to SMC cannot be established, these results are consistent with other surveys, and also indicate that no serious adverse reactions were reported.

Table 40: Adverse drug reactions

Total number of children eligible at cycle 4	1,776	
Number of children unwell since the first day of this SMC cycle	94 (5.3%)	
Symptom name	**Vomiting**	**Diarrhoea**
Number of children (%) reporting symptom out of unwell children	24 (25.5%)	23 (24.5%)
Times per day		
1	4 (16.7)	4 (17.4)
2	4 (16.7)	11 (47.8)
3	7 (29.2)	4 (17.4)
4	5 (20.8)	4 (17.4)
>4	4 (16.7)	0 (0.0)

Symptom:	Yellow eyes	Rash	Abdominal Pain	Loss of Appetite	Fever	Drowsiness	Itchiness
Number of children (%) reporting the symptom	4 (4.3)	0 (0.0)	11 (11.7)	16 (17.0)	83 (88.3)	9 (9.6)	0 (0.0)
Severity							
mild, does not prevent play	0 (0.0)	0 (0.0)	1 (9.1)	3 (18.8)	6 (7.2)	1 (11.1)	0 (0.0)
moderate, prevents normal play	2 (50.0)	0 (0.0)	6 (54.5)	9 (56.2)	25 (30.1)	6 (66.7)	0 (0.0)
required seeking healthcare	2 (50.0)	0 (0.0)	0 (0.0)	4 (25.0)	52 (62.7)	2 (22.2)	0 (0.0)

Annex

Table A1: Survey clusters

Region	District	Village	Cluster number
CENTRE EST	BITOU	BELLAYALA	3
CENTRE EST	GARANGO	BEGUEDO CENTRE	16
CENTRE EST	GARANGO	OUAREGOU	17
CENTRE EST	KOUPELA	DOUAMTENGA	30
CENTRE EST	OUARGAYE	GANZAGA	37
CENTRE EST	OUARGAYE	ZOAGA	38
CENTRE EST	OUARGAYE	ZONGHIN	39
CENTRE EST	POUYTENGA	ANDEMTENGA PEULH	41
CENTRE EST	POUYTENGA	SECTEUR 2	42
CENTRE EST	TENKODOGO	SECTEUR II	49
CENTRE EST	ZABRE	SECTEUR 6	51
CENTRE NORD	BARSALOGHO	BAGAMIOUGOU	1
CENTRE NORD	BARSALOGHO	GOENEGA	2
CENTRE NORD	BOULSA	KOULBAORE	6
CENTRE NORD	DARGO	BILKOUNDI	9
CENTRE NORD	KAYA	DAWAKA	20
CENTRE NORD	KAYA	RAGUITENGA	21
CENTRE NORD	KAYA	SECTEUR 7	22
CENTRE NORD	KAYA	TIBTENGA	23
CENTRE NORD	KONGOUSSI	BILIGA	26
CENTRE OUEST	KOUDOUGOU	PINOU	27
CENTRE OUEST	KOUDOUGOU	SECTEUR 1	28
CENTRE OUEST	KOUDOUGOU	SECTEUR 4	29
CENTRE OUEST	LEO	BOURA	31
CENTRE OUEST	LEO	SECTEUR	32
CENTRE OUEST	NANORO	GOALA	36
CENTRE OUEST	REO	MOGUEYA	43
CENTRE OUEST	SABOU	IPENDO	44
CENTRE OUEST	SAPOUY	POUN	45
CENTRE OUEST	SAPOUY	SALA	46
CENTRE OUEST	TENADO	TENADO	48
CENTRE SUD	KOMBISSIRI	SECTEUR 1	24
CENTRE SUD	KOMBISSIRI	SECTEUR 3	25
CENTRE SUD	MANGA	SAKUILGA	33
CENTRE SUD	MANGA	SIGUINVOUSSE	34
CENTRE SUD	PO	KORO	40
EST	BOGANDE	NOALI	4
EST	BOGANDE	TIERI (18 HAMEAUX DE CULTURE)	5
EST	COALLA	DIANKOUNGOU	8
EST	DIAPAGA	FANGOU I	10
EST	DIAPAGA	KOGUINI	11
EST	DIAPAGA	NALIAMBOUDI	12

EST	FADA	PIEGA	13
EST	FADA	TINACOUANDIBOUDI	14
EST	FADA	TOURDENI	15
EST	GAYERI	GALMORI	18
EST	MANNI	KOMONA	35
NORD	GOURCY	KASBA SAMO	19
NORD	SEGUENEGA	OUEMTENGA	47
NORD	YAKO	KIRSI	50
PLATEAU CENTRAL	BOUSSE	GOABGA	7
PLATEAU CENTRAL	ZINIARE	013 SATTIN	52
PLATEAU CENTRAL	ZINIARE	047 TAONSGO	53
PLATEAU CENTRAL	ZORGHO	KOUMSEOGO	54
PLATEAU CENTRAL	ZORGHO	TALEMBIKA	55

Table A2: Standard error, 95 percent confidence interval, design effect and rate of homogeneity for the main indicators from the final survey

Indicator	Value	s.e.	95%CI	Deff	Deffweight	Deffcluster	roh	b
Mean number of treatments per child	3.853	0.031	3.790,3.916	5.781	1.037	5.575	0.1032	45.323
Coverage of 4 cycles	0.905	0.019	0.860,0.937	6.651	1.057	6.292	0.1194	45.323
Coverage of cycle 1	0.959	0.01	0.932,0.976	4.336	1.107	3.917	0.0658	45.323
Coverage of cycle 2	0.978	0.005	0.964,0.986	2.085	1.084	1.923	0.0208	45.323
Coverage of cycle 3	0.963	0.013	0.927,0.982	7.164	0.968	7.401	0.1444	45.323
Coverage of cycle 4	0.953	0.013	0.920,0.973	5.861	1.037	5.652	0.1050	45.323
Adherence	0.955	0.014	0.917,0.976	7.892	1.017	7.76	0.1666	41.575
Adherence (amongst those who received SMC)	0.996	0.002	0.991,0.998	1.213	0.98	1.238	0.0054	45.323
LLIN coverage in children	0.953	0.014	0.914,0.975	8.093	1.073	7.542	0.1608	41.691
SMC directly observed	0.985	0.005	0.970,0.993	3.19	1.011	3.155	0.0486	45.323
Caregiver knowledge about SMC	7.974	0.149	7.675,8.272	3.372	1.001	3.369	0.0534	45.323
Reported CHW adherence to guidelines	7.642	0.076	7.491,7.794	8.425	1.284	6.562	0.1354	42.065
Awareness of SMC dates	0.967	0.01	0.941,0.982	3.099	0.999	3.102	0.0511	42.102
LLIN coverage (all ages)	0.455	0.056	0.347,0.568	73.356	1.087	67.485	0.5430	123.446
Proportion that could sleep under LLIN (if 2/net)	0.495	0.058	0.379,0.611	13.731	1.051	13.065	0.6183	20.513
Proportion of households with an LLIN	0.505	0.059	0.390,0.621	13.772	1.053	13.079	0.6190	20.513
Proportion of households with a 1 LLIN per 2 people	0.485	0.057	0.373,0.599	13.153	1.057	12.444	0.5865	20.513

Value – mean value of the indicator; s.e. – standard error; 95%CI – 95% confidence interval; Deff – overall design effect; Deffweight – design effect due to weighting; Deffcluster – design effect due to clustering; roh – rate of homogeneity; b – weighted mean cluster size

IRSS survey report

Institution: *Institut de Recherche en Sciences de la Santé (IRSS) / Institut des Sciences et Techniques (INSTech)*

Lead investigator*: Prof. Jean Bosco Ouédraogo*

Country: *Burkina Faso*

Start and end dates of surveys: *5th to 18th November 2017.*

Description of work

This report covers the coverage survey activities of the project targeting the fourth (4th) round of SMC drugs administration in 2017. During this period major activities were:

- ✓ *Debriefing meeting of the coverage survey 3 (of the third round of SMC drug administration in 2017);*
- ✓ *Training session on the new questionnaire on Dharma;*
- ✓ *Field activities of the fourth round of SMC coverage survey (Survey 4).*

Process and implementation of the surveys

Please include details under each of the following areas:

Dates of the survey:

The survey was carried out from 5th to 18th November 2017

Description of mapping and segmentation, and household selection

A total of 55 villages have been selected for the 2017 SMC survey. The survey was designed to obtain a total sample of at least 1,100 children aged between three months and seven years, in the country. It was expected that there would be 55 clusters, and therefore approximately 20 children would be sampled from each cluster. Practically, the study team had to draw a sketch map of the village and identify key easily recognisable features on the ground such as main road(s), paths, mosque, school, etc. On this sketch map the main blocks of habitation have been indicated, and the village divided into a number of segments, with approximately 100 individuals with at least 20 children of the selected age range. Based on the total village population, the number of needed segments was calculated as the approximate village population total divided by 100, rounded down to the nearest whole number. Having decided on the number of segments, the sketch map of the village have been divided into the required number of segments and the segments labelled on the map. Segments did not need to be exactly equal in terms of number of dwellings, some variation were acceptable if this made them easier to be identified on the ground. A random number has been allocated to each segment and the team had to randomly choose one segment to be surveyed. The selected segment had to be indicated on the map with an arrow and by writing 'selected' or similar. The sketch map had to be labelled with district, village and date. Photos of the completed map had to be taken using the tablet. The paper version of the map had to be retained also.

Description of the organisation of the data collection

For this survey there were four teams on the field for data collection and the supervision of the work. Each team was composed of three to four data collectors and steered by a supervisor. Each team was in charge of data collection in 13-14 villages. All households within the chosen segments had to be visited, and in each household all children within the specified age range had to be interviewed. Data was collected directly on tablet PCs by data collectors and supervisors as well. Dharma software was used for the study questionnaires on these tablets.

Supervisors were in charge of the data quality control and the daily data uploads to the server in the UK via the internet. Data collection started on 5th November by two teams in two villages. The four teams were deployed by 6th November and were actively collecting data in four health districts. From 5th to 17th November a total of 2,132 children aged from four months to seven years were visited in their households. The average number of children visited daily by the each team was 38.6 children as shown in Table 1.

Table 1: Number of children interviewed according to villages and health districts

Start date	End date	Total Health districts n=34	Total Health facilities n=55	Total villages n=55	Average number of children / village	Total children investigated
05/11/2017	05/11/2017	2	2	2	35	70
06/11/2017	06/11/2017	4	5	5	43.4	217
07/11/2017	07/11/2017	5	5	5	32.4	162
08/11/2017	08/11/2017	6	6	6	40.7	244
09/11/2017	09/11/2017	4	5	5	37.4	187
10/11/2017	10/11/2017	3	3	3	40	120
11/11/2017	11/11/2017	2	2	2	44	88
12/11/2107	12/11/2107	4	4	4	38	152
13/11/2017	13/11/2017	5	6	6	43.5	261
14/11/2017	14/11/2017	8	8	8	37	296
15/11/2017	15/11/2017	2	2	2	36.5	73
16/11/2017	16/11/2017	5	6	6	37.7	226
17/11/2017	17/11/2017	1	1	1	36	36
05/11/2017	17/11/2017	34^{α}	55	55	38.6	2,132

α = Total health district visited, even though some districts have been visited more than once.

Dates and content of training:

For the SMC coverage survey 4, a new questionnaire was built and proposed to the investigators. A training meeting was therefore necessary for supervisors and data collectors in order to master the new questionnaire before field work. The training was held on 1st November 2017 at the meeting room of the INSTech from 9 am to 5 pm. Attendees were:

-   Professor Jean Bosco Ouedraogo and Dr Zongo Issaka as the main trainers;

-   A group of 10 data collectors available in Bobo-Dioulasso and the four supervisors as the trainees.

A Skype call with Dr Paul Snell (referee of the questionnaire from LSTMH) was made in case of necessity to clarify some unsolved questions.

A first training session taught how to download and install the new version of Dharma (containing the questionnaire) on the devices. Furthermore, it went through how to save, edit, delete or complete records on the questionnaire.

The second training session covered filling in the questionnaire, which was composed by 3 different forms: the bed nets survey, the household roster and the main survey. All these three forms were covered during the training using dummy household cases.

Number of staff and organisation in teams:

The core study staff comprised 6 individuals: the study PI (prof. Jean Bosco Ouedraogo), an epidemiologist (Dr Issaka Zongo), two scientists, a geographer and a data manager. For the field work, four (4) teams of data collectors and supervisors were constituted. Each team was consisted of 3 to 4 data collectors in charge of an average of 14 villages and a supervisor.

Details of how call-backs were arranged:

Supervisors were responsible of the data quality control. They were also responsible of identifying all non-responses. To minimize non-response, supervisors had to use call back system for distant fulfilment of the questionnaire as much as possible. The CHWs as local team members played a key function during call-backs by finding out non-respondents and interacting directly with them and with supervisors.

Supervision arrangements:

The four supervisors in charge of data quality control, supervised data collection in each villages, from the segmentation of clusters (villages) to the data uploading to the server. They were also responsible to conduct a parallel quality control (QC) survey (cf below).

Quality control:

*During survey 4, quality control (QC) by carrying out a second visit in households was performed by each supervisor in some randomly selected villages. This survey was conducted in 70 percent of the villages (i.e. 38 out of 55 villages). Globally, a total of 118 households were visited comprising 121 caregivers and 193 children. **Table 2** summarizes the quality control (QC) activities performed by supervisors during the cycle 4 coverage survey.*

Table 2: Quality control visit: distribution of households and children accordingly to supervisors.

Supervisors (In)	Villages in charge n	Visited villages n (%)	Household visited n (%)	Total Caregivers n (%)	Total children < 7 years n (%)
supervisor 1 (ZM)	14	7 (50)	22 (18.64)	23 (19)	47 (24.35)
Supervisor 2 (KA)	14	10 (71.43)	10 (8.47)	11 (9.10)	14 (7.25)
Supervisor 3 (BN)	14	8 (57.14)	29 (24.58)	31 (25.62)	53 (27.46)
Supervisor 4 (CYD)	13	13 (100)	57 (48.31)	56 (46.28)	79 (40.94)
Total	55	38 (69.1)	118 (100)	121 (100)	193 (100)

Any problems encountered

Please give details of any problems you encountered and any action taken.

As noticed during survey 3, round 4 drugs administration has not been effective in the health district of Pouytenga. In this health district, an internal conflict between the health district administration and health facilities workers impaired 2 rounds of SMC drugs distribution to children living on the health district area (September and October).

During survey 4 the team experienced difficulties related to internet connection impairing data daily uploading to the server. A context of insufficient internet connectivity was associated to slight trouble on Dharma software. It was noticed that survey 4 data were also heavier than data from previous surveys. Teams worked hard to find out the best way to upload data on required time

Lessons learned

Please give details of any lessons learned during this process.

- *SMC ID cards have been incompletely filled in by the CHW. This was probably because only the first dose of SMC is generally supervised by the CHW. As a matter of fact, most often only the first doses were ticked off on the ID cards.*
- *The daily data uploading to the server was impossible because of the weakness of the network in villages in general.*
- *The software of the questionnaire should be as much light as possible;*

Any recommendations to improve quality of SMC programmes &/or survey data collection

Please detail any recommendations you may have, based on your experiences carrying out this survey.

- *It may be important for the national malaria control program (NMCP) to take initiative for supervising all SMC doses during drugs administration phases in order to get a better coverage on days two and three as it is being done in some bordering countries like Ghana.*
- *The NMCP should consider to extend the SMC to up to ten years old children;*

Any other comments

No comments

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